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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

S-115

ED 061320

Development of USES Aptitude Test Battery for

Weaver

(asbestos prod.; textile) 683.782

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MANPOWER ADMINISTRATION
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Washington, D.C. 20210

Technical Report on Development of USES Aptitude Test Battery

For .....

Weaver (carpet & rug; textile) 683.782

S-115

U. S. Employment Service
in Cooperation with
South Carolina and Wisconsin State Employment Services

January 1967

FOREWORD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Frank H. Cassell

Frank H. Cassell, Director
U. S. Employment Service

GATB Study #2116
and 2162

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Weaver (carpet & rug; textile) 683.782
S-115

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Weaver 683.782. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
S - Spatial Aptitude	80
P - Form Perception	80
K - Motor Coordination	70
F - Finger Dexterity	75

RESEARCH SUMMARY

Sample:

57 male workers employed at the Deltox Rug Company, Oshkosh, Wisconsin.

Criterion:

Supervisory ratings

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .48 (P/2 less than .0005)

Effectiveness of Norms:

Only 68% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-115 norms, 79% would have been good workers. 32% of the non-test-selected workers were poor workers; if the workers had been test-selected with the S-115 norms, only 21% would have been poor workers.

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	68%	79%
Poor Workers	32%	21%

SAMPLE DESCRIPTION

Size:

N = 57

Occupational Status:

Employed workers

Work Setting:

Workers were employed at the Deltox Rug Company in Oshkosh, Wisconsin.

Employer Selection Requirements:

Education: None
Previous Experience: None
Tests: None
Other: Personal interview and a check of references.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the sample had at least one month of job experience.

TABLE 2

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience

	Mean	SD	Range	r
Age (years)	25.1	4.2	18-35	-.306*
Education (years)	11.1	1.8	7-14	.105
Experience (months)	5.1	4.5	1-17	.389**

*Significant at the .05 level
**Significant at the .01 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A were administered during the period July 1954 and January 1956.

CRITERION

The criterion data consisted of ratings in four broad categories made by two foremen and a second line supervisor. Reratings were made with a two month interval between the two sets of ratings.

Reliability:

The coefficient of reliability between the two sets of ratings was .88 (.94 when corrected by application of the Spearman-Brown Prophecy formula). The final criterion consisted of the average of the two sets of ratings.

Criterion Score Distribution:

Actual Range:	38-66
Mean:	50.1
Standard Deviation:	8.9

Criterion Dichotomy:

The criterion distribution was dichotomized into high and low groups by placing 32% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score was 48.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitude K, which does not have any significant statistical evidence, was considered for inclusion in the norms because the qualitative analysis indicated that it was of supreme importance for the duties involved in this job. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed.)

Aptitudes	
S - Spatial Aptitude	Required to visulize three dimensional relationships involved in repairing breaks in strands of warp or filling yarn.
P - Form Perception	Required to make visual inspections of the looms prior to and during operation and to detect imperfections in weaving and breaks in wrap fibres.
K - Motor Coordination	Required to coordinate eye and hand movements in repairing breaks in wrap fibres.
F - Finger Dexterity	Required to move fingers rapidly and accurately in repairing breaks in wrap fibres.
M - Manual Dexterity	Required to move the hands skillfully in replacing empty shuttles with full ones, in filling empty shuttles with supply of fibre, and in repairing breaks in warp fibres.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Aptitude	Mean	SD	Range	r
G - General Learning Ability	99.7	14.5	67-135	.233
V - Verbal Aptitude	95.5	15.6	68-151	.019
N - Numerical Aptitude	98.2	16.3	51-126	.139
S - Spatial Aptitude	104.1	16.7	71-137	.460**
P - Form Perception	98.9	15.7	58-129	.465**
Q - Clerical Perception	98.5	14.2	66-141	.075
K - Motor Coordination	97.1	17.7	62-153	.033
F - Finger Dexterity	102.2	20.3	60-175	.350**
M - Manual Dexterity	109.6	20.2	80-161	.350**

*Significant at the .05 level
**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important				X	X		X		X
Irrelevant									
Relatively High Mean				X				X	X
Relatively Low Standard Deviation	X					X			
Significant Correlation with Criterion				X	X			X	X
Aptitudes to be considered for Trial Norms				S	P		K	F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes S, P, K, F, and M at trial cutting scores were able to differentiate between the 68% of the sample considered good workers and 32% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one third of the sample with three-aptitude norms. For two-aptitude norms, minimum cutting scores slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of S-80, P-80, K-70, and F-75 provided the optimum differentiation for the occupation of Weaver (carpet & rug; textile) 683.782. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .48 (statistically significant at the .0005 level).

TABLE 6

Concurrent Validity of Test Norms, S-80, P-80, K-70 and F-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	2	37	39
Poor Workers	8	10	18
Total	10	47	57

Phi Coefficient (ϕ) = .48 Chi Square (X^2) = 13.13
Significance Level = P/2 $<$ .0005

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-26 which is shown in Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .40 is obtained with the OAP-26 norms of S-85, P-90, and F-85

S-115 GATB Study #2162

Weaver (carpet & rug; textile) 683.782

Check Study

Sample:

37 workers (14 male and 23 female) employed at the Aragon Plant, J. P. Stevens & Company, Inc., Rock Hill, South Carolina.

TABLE 7

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlation with Criterion (r) for Age, Education, Experience, and Aptitudes of the GATB N=37

	Mean	SD	Range	r
Age (years)	36.4	9.3	22-57	-.211
Education (years)	8.5	2.0	4-12	-.008
Experience (months)	113.4	71.7	24-369	-.094
G - General Learning Ability	89.0	11.9	60-116	.152
V - Verbal Aptitude	89.6	11.3	65-113	-.087
N - Numerical Aptitude	86.8	13.4	40-113	.113
S - Spatial Aptitude	88.7	15.0	58-117	.349*
P - Form Perception	84.8	17.1	34-116	.313
Q - Clerical Perception	87.2	13.2	53-122	.404*
K - Motor Coordination	93.9	19.7	39-136	.229
F - Finger Dexterity	96.9	19.1	44-135	.295
M - Manual Dexterity	97.5	18.7	62-134	.409*

*Significant at the .05 level

Criterion:

Supervisory ratings

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Principal Activities:

The job duties for each workers are those shown in the job description in the Appendix.

Concurrent Validity:

Phi Coefficient = .37 ($P/2 < .025$)

Effectiveness of Norms:

Only 68% of the non-test-selected workers in this sample were good trainees; if they had been test-selected with the S-115 norms, 82% would have been good workers. 32% of the non-test-selected workers used in this study were poor workers; if they had been test-selected with the S-115 norms, only 18% would have been poor workers. The effectiveness of the norms when applied to this independent sample is shown graphically in Table 8.

TABLE 8

Effectiveness of S-115 Norms on Check Study

	Without Tests	With Tests
Good Workers	68%	82%
Poor Workers	32%	18%

Predictive Validity of Test Norms
(S-80, P-80, K-70, F-75)
Check Study Sample (South Carolina)

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	18	25
Poor Workers	8	4	12
Total	15	22	37

Phi Coefficient (ϕ) = .37 Chi Square (X^2) = 5.0
Significance Level = $P/2 < .025$

January 1967 A-P-P-E-N-D-I-X S-115

FACT SHEET

Job Title: Weaver (carpet & rug; textile) 683.782

Job Summary: Operates a battery of looms to weave rugs or cloth: Reads specifications to determine size and pattern of rug or cloth to be woven. Sets up machine and throws lever to start loom. Makes tour among looms to observe operation, watching closely for mispicks or defects. Stops machine to replace empty shuttles with full ones. Fills empty shuttles with supply of fibre. Removes imperfections in rug or cloth by stopping machine and removing all filling back to point at which defect occurred. Repairs breaks in strands of warp or filling yarn by tying short piece of warp fiber to one end of broken warp and drawing it through drop wires, heddles, and reed opening by means of metal hook.

Work Performed: Reads specifications from job ticket to determine size of rug or cloth to be woven and the pattern required. Selects proper color of fibre to put in shuttles. Makes visual inspection of looms to be sure shuttles are in position, no strand of yarn is broken, and set-up is ready for operation. Throws lever to start loom. Makes tours among the looms to observe operation, watching closely for mispicks or defects. Stops machines to replace empty shuttles with full ones. Fills empty shuttles with supply of fibre.

Removes imperfections in rug or cloth by stopping machine and removing all filling back to point at which defect occurred. Repairs breaks in strands of warp or filling yarn (breaking of warp or filling strands causes machine to stop automatically) by retrieving strand leading from warp beam (large spool), tying a short broken end and drawing strand through drop wires (pieces of metal which drop and automatically stop machine when yarn breaks), through heddles (which raise and lower threads to form openings through which filling yarn passes), and through corresponding reed opening, using reed hook; ties warp yarn ends together with Weaver's knot, cuts off excess yarn, and resumes operation.

Notifies Loom Fixer when looms need adjustment.

(This sheet is printed in duplicate. One copy should remain as part of the Appendix in order to complete the technical report. The other copy can be removed by employment service personnel who wish to set up separate fact sheet files.)

GPO 924-020

January 1967 A-P-P-E-N-D-I-X S-115

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Work Performed: Reads specifications from job ticket to determine size of rug or cloth to be woven and the pattern required. Selects proper color of fibre to put in shuttles. Makes visual inspection of looms to be sure shuttles are in position, no strand of yarn is broken, and set-up is ready for operation. Throws lever to start loom. Makes tours among the looms to observe operation, watching closely for mispicks or defects. Stops machines to replace empty shuttles with full ones. Fills empty shuttles with supply of fibre.

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